Awareness and attitude of Spanish medical authors to open access publishing and the "author pays" model

By Angel A. Hernández-Borges, PhD, MD, borges@teide.net

Raúl Cabrera-Rodríguez, MD, raulcabrera22@hotmail.com

Abián Montesdeoca-Melián, MD, abipum@hotmail.com

Begoña Martínez-Pineda, MD, begompineda@hotmail.com
Pediatric and Intensive Care Unit—Department of Neonatology, Hospital Universitario de Canarias Tenerife, Spain

Maria Luisa Torres-Álvarez de Arcaya, MD, ahborges@telefonica.net
Primary Care Center La Orotava-Dehesa Servicio Canario de la Salud, Tenerife, Spain

Alejandro Jiménez-Sosa, PhD, Psych, ajimenez@huc.es
Research Unit, Hospital Universitario de Canarias Tenerife, Spain

INTRODUCTION

Open access publishing (OAP) aims to provide complete and free electronic access to scientific research articles [1]. Such access may be achieved via (1) open access journals (i.e., journals permitting free access to online content), currently around 2% of the total corpus of articles in science, technology, and medicine [2]; or (2) self-archiving on institutional or personal Websites, which provides free access to post- or preprint manuscripts. In addition to universal access to scientific knowledge, the OAP model may result in considerable savings for libraries [3] and the potential benefit for authors of greater exposure to their works. However, to date, citations to OA journals have only slightly increased compared to subscription-based journals [4].

With respect to funding, nearly 20% of OAP articles have been produced by charging authors (or indirectly, their organizations) through so-called ''publication fees'' or ''author fees'' [2]. The success of such journals greatly depends on authors' willingness to submit their research to such journals despite publication fees ranging between $350 and $1,000 USD. It is unclear whether authors, especially first-time and social science authors, are reluctant to back OAP journals because the journals are not considered sufficiently prestigious or because the authors consider the costs involved too high [5, 6]. Moreover, the ''author pays'' model also poses a significant financial obstacle for researchers or their institutions in low-income countries [7]. Certain OAP journals discretionally waive charges to such researchers.

Little is known about how this model, first introduced in English-speaking countries, will be adopted in a country as culturally different as Spain. This research sought to evaluate the extent of familiarity with OAP of biomedical authors who publish in Spanish and their attitudes toward the author-pays model.

METHODS

Subjects

The investigators selected the first authors of Spanish-language articles (with the exception of letters) appearing in PubMed between June and December 2003. To locate authors, the researchers used the following search syntax: *("com"[ad] OR "es"[ad] OR "org"[ad]) NOT letter[pt] AND Spanish[Lang] AND ("2003/06/01"[EDAT]: "2003/12/31"[EDAT])*, where ''es'' represents a specific email domain for Spain. Most Spanish authors' email addresses would be collected using ''.com,'' ''.es,'' and ''.org.'' The investigators excluded those authors who did not provide an email address and sifted the original list of 716 entries found in PubMed, eliminating duplications and authors not residing in Spain. This process resulted in a final list of 354 authors. Authors were classified according to (1) type of institution (university, university hospital, non-university hospital, or government institution), (2) residential Spanish region, and (3) medical speciality.

Instrument

This research employed an author-elaborated nine-item questionnaire (supplemental appendix online). Item relevance and face validity were established by consensus among the researchers. Between February and May 2004, the questionnaire was emailed thrice by individual emailings to avoid spam-blocking systems. Despite this precaution, 14% of emails were automatically rejected. All responses received before June 15, 2004, were analyzed.

Statistical analysis

To determine whether responding authors were representative of the global sample initially selected, the team compared the following demographic and publication variables: province of residence, institution type, biomedical speciality, existence of an online edition of the journal in which articles were published, and publication of other articles during the same period.

The investigators then studied the association between author responses and medical speciality, type of institution, and region of residence. All comparisons were performed using Pearson's chi-square test. All statistical calculations were performed using SPSS

Supplemental electronic content is included with this paper on PubMed Central.

Table 1
Author* awareness and attitudes to open access publishing and journals based on author fees (n = 100)

Item	n
1. Familiar with the fundamental ideas of the open access movement	22 (10, 12)†
2. Familiar with the Budapest Open Access Initiative	8
3. Institutional archive available as a repository for articles	24
4. Authors who had made their work accessible by Internet	21
5. Authors who had published in an open access journal that charges authors	5
6. Authors who would submit their manuscripts to a journal that charges authors	9
7. Major difficulties in submitting papers to journals based on authors' fees:	
■ Lack of funds	31
■ Uncertain journal rating	19

* Mean age 39.6 ± 8 years.
† Number in parenthesis indicate respondents who correctly answered questions #8 (option c) and #9 (option a), respectively.

12.0.1 (Chicago, Illinois), and $P < 0.05$ was considered significant.

RESULTS

Of 354 surveyed authors, 100 (28%) answered and returned the questionnaire (responders). No significant differences were observed between responders and nonresponders with respect to the demographic and publication variables studied.

Table 1 summarizes responses to the survey. No significant differences were found among responders according to medical speciality, type of institution, or region of residence. The study found a low level of awareness of the OAP model (22%, N = 22) and of acceptance of journals charging author fees among Spanish authors. Awareness of the Budapest Open Access Initiative 2001 [8], a landmark event, was even lower (8%, N = 8). Similarly, only nine respondents (9%) inidicated they would pay author fees to publish in an OA journal, and only five (5%) had published in an open accesss journal that charged fees. Nearly one-third of respondents noted that lack of funds was a significant barrier to open access publishing, while 19 (19%) indicated the prestige factor as a barrier.

DISCUSSION

This study is subject to a number of limitations. While the number of study respondents was low, given their similarity to the whole sample, they constituted a representative group. This study is also limited by basing selection of samples on PubMed articles that include an author email address, which may introduce bias in that such authors would likely have greater experience with Web resources and, potentially, exposure to OAP. Finally, the investigators assumed that responders and study subjects were the same persons.

Other studies investigating OA awareness have shown higher awareness rates [9, 10]. These differences may be due to the fact that the initial OAP movement appeared in an English-speaking setting. Whatever the case, the low level of awareness about a model promising free access to an enormous amount of scientific information is striking, particularly because the surveyed authors are essentially ''consumers'' of such material published in English-language journals.

While the OAP model has many potential advantages (improved accessibility, dissemination and citation of studies, reduced production costs, and immediate community awareness of scientific advances), the model also generates concerns: circulation of versions of the same article with different degrees of peer review, financial difficulties for subscription-based journals, potentially weakened peer-review requirements, and increased rates of acceptance as a source of revenue for author fee-based journals [2] and additional economic pressures on authors [11].

One of the factors that most threatens to limit the success of OAP is the charge to authors. One way to avoid further charges to unsupported authors is the proposal to waive publication charges to those residing in less-developed countries [12]. In addition, it is unclear how these exemptions would be applied to authors of any geographical origin without research grants or institutional aid [13]. Unfunded research accounts for 25% of articles in major English-language medical journals [14] and even more in certain specialities: 26% of articles in psychiatry [15], 63% in emergency medicine [16], 60% in pathology, 62% in internal medicine, and 74% in surgery [17]. Spanish authors' articles have even lower degrees of research funding, from 5% to 23% [18, 19]. If author fees were universally introduced, an important segment of authors in Spanish- and English-speaking countries might be excluded from publishing. These extra charges could further increase and further inhibit unsupported research, if the proposal to apply a reviewer fee on submission is accepted [20]. Access to medical knowledge might eventually be improved, but, paradoxically, its production may be restricted by economic constraints.

Authors responding to this study clearly rejected author fees due to lack of funding and knowledge about the prestige or reputation of OA journals. This rather radical opposing attitude was not found in other similar studies performed with selected English-speaking authors. A survey about OA conducted by the editors of the *Proceedings of the National Academy of Sciences* found that 50% of authors expressed willingness to pay, although only 20% would pay more than $500 [21]. Likewise, a group of *BMJ* authors expressed concern about the existence of such charges, but they attached more weight to journal impact factor and reputation [7].

An alternative to OAP journals that charge authors is self-archiving, called the ''green road'' by some [3]. In this model, reviewed articles are archived on freely accessible Websites. The green road necessitates changes in journal policy to allow self-archiving, already announced by some of the biggest publishers [22]. This self-archiving variant of OAP seems to offer

most of the advantages of OAP while avoiding the drawbacks of author-pays OAP journals.

The Internet has brought with it an era of great complexity regarding the dissemination of medical knowledge, where the models chosen may have simultaneous beneficial and counterproductive effects. Authors, publishers, and governmental and information agencies must take into account cultural and geographical differences so that new decisions do not increase already existing inequalities between countries.

ACKNOWLEDGMENT

The authors sincerely thank Michael McLean for his help in the translation and editing of this article.

REFERENCES

1. GOODMAN D. The criteria for open access. Serials Rev 2004 Nov;30(4):258–70.
2. REGAZZI J. The shifting sands of open access publishing, a publisher's view. Serials Rev 2004 Nov;30(4):275–80.
3. HARNAD S. Open access to peer-reviewed research through author/institution self-archiving: maximizing research impact by maximizing online access. J Postgrad Med 2003 Oct–Dec;49(4):337–42.
4. TESTA J, MCVEIGH ME. The impact of open access journals: a citation study from Thomson ISI. [Web document]. Philadelphia, PA: The Thomson Corporation, 2005. [cited 21 Apr 2005]. <http://www.isinet.com/media/presentrep/acropdf/impact-oa-journals.pdf>.
5. STEVENSON I. ''Open access'' for the rich only. The Times Higher Education Supplement [serial online]. 9 Jan 2004. London, UK: TSL Education, 2005. [cited 22 Apr 2005]. <http://thes.co.uk/search/story.aspx?story_id=2009626>. (subscription required.)
6. ANDERSON R. Author disincentives and open access. Serials Rev 2004 Nov;30(4):288–91.
7. SCHROTER S, TITE L, SMITH R. Perceptions of open access publishing: interviews with journal authors. BMJ 2005 Apr; 330(7494):756–9.
8. OPEN SOCIETY INSTITUTE. Budapest open access initiative. [Web document]. New York, NY: The Institute, 2005. [cited 17 Apr 2005]. <http://www.soros.org/openaccess/>.
9. PELIZZARI E. Academic staff use, perception and expectations about open-access archives. a survey of social science sector at Brescia University. [Web document]. E-prints in Library and Information Science, 2005. [cited 18 Apr 2005]. <http://eprints.rclis.org/archive/00000737/>.
10. JOINT INFORMATION SYSTEMS COMMITTEE. JISC/OSI journal author survey report. [Web document]. London, UK: The Committee, 2005. [cited 22 Apr 2005]. <http://www.jisc.ac.uk/uploaded_documents/JISCOAreport1.pdf>.
11. EWING J. ''Open access'' will not be open to everyone [letter]. Nature 2003 Oct 9;425(6958):559.
12. BIOMED CENTRAL. Forum [editor's note]. Open Access Now [serial online]. London, UK: Current Science Group, 2006. [cited 26 Jan 2006]. <http://www.biomedcentral.com/openaccess/forum/?letter=20040301sd>.
13. PUBLIC LIBRARY OF SCIENCE. Frequently asked questions. [Web document]. San Francisco, CA: The Library, 2005. [cited 22 Apr 2005]. <http://www.plos.org/faq.html>.
14. STEIN MD, RUBENSTEIN L, WACHTEL TJ. Who pays for published research? JAMA 1993 Feb 10;269(6):781–2.
15. SILBERMAN EK, SNYDERMAN DA. Research without external funding in North American psychiatry. Am J Psychiatry 1997 Aug;154(8):1159–60.
16. ERNST AA, HOURY D, WEISS SJ. Research funding in the four major emergency medicine journals. Am J Emerg Med 1997 May;15(3):268–70.
17. BERMAN JJ, BORKOWSKI A, RACHOCKA H, MOORE GW. Impact of unfunded research in medicine, pathology, and surgery. South Med J 1995 Mar;88(3):295–9.
18. ÁLVAREZ SOLAR M, LÓPEZ GONZÁLEZ ML, CUETO ESPINAR A. Análisis temático y metodológico de la investigación en atención primaria. Aten Primaria 1996 Oct;18(6):297–303.
19. AIBAR REMÓN C, RABANAQUE MJ, ALVAREZ-DARDET C, NOLASCO A, MONCHO J, GASCÓN E. Evolución de los diseños epidemiológicos de la investigación clínica en España (1975–1994). Rev Esp Salud Pública 1999 Jul;73(4):445–53.
20. HOUSE OF COMMONS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY, UNITED KINGDOM PARLIAMENT. Tenth report: should the author pay? [Web document]. London, UK: The Parliament, 2005. [cited 22 Apr 2005]. <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/39910.htm>.
21. COZZARELLI NR, FULTON KR, SULLENBERGER DM. Results of a PNAS author survey on an open access option for publication. Proc Natl Acad Sci USA 2004 Feb;101(5):1111.
22. ELSEVIER. Elsevier author gateway. [Web document]. Chicago, IL: Elsevier, 2005. [cited 22 Apr 2005]. <http://authors.elsevier.com/Home.html?sloc=SAB&sl=&al=%7E#SAB>.

Received September 2005; accepted February 2006

Comparison of top-performing search strategies for detecting clinically sound treatment studies and systematic reviews in MEDLINE and EMBASE*

By Sharon S.-L. Wong, PhD, RD, Assistant Professor, sharonw@ryerson.ca,
School of Nutrition, Faculty of Community Services, Ryerson University, 350 Victoria Street, Toronto, Ontario, M5B 2K3 Canada

Nancy L. Wilczynski, MSc, Research Associate, wilczyn@mcmaster.ca,
Health Information Research Unit, Department of Clinical Epidemiology and Biostatistics

R. Brian Haynes MD, PhD,† Professor of Clinical Epidemiology and Medicine, bhaynes@mcmaster.ca,
Hedges Team, Health Information Research Unit, Department of Clinical Epidemiology and Biostatistics and Department of Medicine, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, L8N 3Z5 Canada

BACKGROUND

Increasingly, clinicians are doing their own searches using large biomedical literature databases [1]. Choice

* Source of funding: National Library of Medicine, grant no. 5R01LM06866-04.
† Corresponding author.

Table 1
Top-performing strategies yielding high sensitivity and high specificity and minimizing the difference between sensitivity and specificity for detecting treatment articles in MEDLINE and EMBASE in the year 2000

Ovid search strategy*	Sensitivity (95% CI)	Specificity (CI)	Precision (CI)
High sensitivity strategies			
MEDLINE	**n = 930**	**n = 27,467**	**n varies by row**
clinical trial.pt. OR random:.tw. OR tu.xs.	99.1% (98.6 to 99.7)	71.0% (70.4 to 71.5)	10.0% (9.4 to 10.6)
EMBASE	**n = 1,256**	**n = 26,513**	**n varies by row**
Random:.tw. OR clinical trial:.mp. OR exp health care quality	98.9% (98.3 to 99.5)	72.0% (71.4 to 72.5)	14.3% (13.6 to 15.1)
High specificity strategies			
MEDLINE	**n = 930**	**n = 27,467**	**n varies by row**
randomized controlled trial.pt.	92.8% (91.1 to 94.5)	97.6% (97.4 to 97.7)	55.5% (52.8 to 57.8)
EMBASE	**n = 1,256**	**n = 26,513**	**n varies by row**
randomized.tw.	63.2% (60.6 to 65.9)	96.7% (96.5 to 96.9)	47.5% (45.1 to 49.9)
Strategies minimizing difference between sensitivity and specificity			
MEDLINE	**n = 930**	**n = 27,467**	**n varies by row**
randomized controlled trial.pt. OR randomized.mp. OR placebo.mp.	95.8% (94.5 to 97.1)	95.0% (94.8 to 95.3)	38.5% (36.5 to 40.5)
EMBASE	**n = 1,256**	**n = 26,513**	**n varies by row**
random:.tw. OR placebo:.mp.OR double-blind:.tw.	94.5% (93.3 to 95.8)	92.6% (92.3 to 92.9)	37.8% (36.1 to 39.5)

* Search strategies are presented in Ovid syntax. pt = publication type;: = truncation; tw = text-word (word or phrase appears in title or abstract); tu = therapeutic use subheading; xs = exploded subheading; mp = multiple posting (term appears in title, abstract, or subject heading); exp = exploded subject heading.

of database can influence the success of a search [2]. MEDLINE is often searched first due to its free access through the PubMed interface and its broad coverage of the biomedical literature, including nursing, dentistry, paramedic professions, reproductive biology, and clinical and experimental medicine. EMBASE searching is not free but has greater coverage of European and non-English language publications and topics such as pharmaceuticals, psychiatry, toxicology, and alternative medicine. The overlap of EMBASE and MEDLINE is estimated to be 10% to 87%, depending on the topic [3].

To date, search strategy development has focused more on MEDLINE [4–9] than on EMBASE. Search strategies developed for MEDLINE cannot be directly translated for use in other databases because indexing practices vary and thesaurus terms are not equivalent across databases.

In the 1990s, the Hedges Team developed MEDLINE search strategies for a small subset of 10 journals [10, 11]. This work has been expanded using data from 161 journals indexed in MEDLINE in 2000 and a 55-journal subset for EMBASE. The MEDLINE strategies [12–18] and some EMBASE strategies [19–22] have previously been published. This report compares the sensitivity and specificity of top-performing search strategies for detecting treatment and review articles in MEDLINE and EMBASE.

The methods used in this study have been detailed elsewhere [17]. Briefly, the operating characteristics of search strategies were compared with a manual review of 161 health care journals in 2000 for MEDLINE [23] and a 55-journal subset for EMBASE [24]. Six research assistants manually assessed all articles for studies meeting methodologic criteria in 7 purpose categories (treatment, causation, prognosis, diagnosis, economics, clinical prediction, and reviews). The authors reported purpose category definitions and methodologic criteria in an earlier paper [25]. To evaluate search strategies designed to retrieve studies meeting basic methodologic criteria, index terms and text-words related to research design features were run as search strategies. Search strategies were treated as ''diagnostic tests'' for sound studies, and the manual review (hand search) was treated as the ''gold standard.'' Operating characteristics of the search strategies were determined. Top-performing strategies for detecting sound treatment and systematic review articles in MEDLINE [17, 18] and EMBASE [26, 27] were compared.

RESULTS

Tables 1 and 2 present top-performing search strategies that allow for meaningful comparisons between MEDLINE and EMBASE.

Strategies for detecting treatment studies in MEDLINE and EMBASE (Table 1)

In both MEDLINE and EMBASE, strategies used text-words and index terms. The high-sensitivity strategies in both databases performed similarly but used different combinations of terms except for the same text-word, ''random:.tw.'' The high-sensitivity MEDLINE strategy used the publication type, ''clinical trial,'' and the exploded therapeutic use subheading, ''tu.xs,'' neither of which was supported in EMBASE. The high-sensitivity EMBASE strategy used the exploded subject heading, ''health care quality,'' a term not supported in MEDLINE. Because several terms in these top-performing strategies were uniquely supported in their respective databases, it was not possible to directly test them in the opposite database.

Strategies that yielded high specificity and minimized the difference between sensitivity and specificity performed slightly better overall in MEDLINE than in EMBASE. MEDLINE strategies used the publication

Table 2
Top-performing strategies yielding high sensitivity and high specificity and minimizing the difference between sensitivity and specificity for detecting systematic reviews in MEDLINE and EMBASE in the year 2000

Ovid search strategy*	Sensitivity (95% CI)	Specificity (CI)	Precision (CI)
High sensitivity strategies			
MEDLINE	**n = 753**	**n = 48,275**	**n varies by row**
search:.tw. OR meta analysis.mp,pt. OR review.pt. OR di.xs. OR associated.tw.	99.9% (99.6 to 100)	52.0% (51.6 to 52.5)	3.14% (2.92 to 3.37)
EMBASE	**n = 220**	**n = 27,549**	**n varies by row**
Exp methodology OR search:.tw. OR review.pt.	94.6% (91.5 to 97.6)	63.7% (63.2 to 64.3)	2.0% (1.8 to 2.3)
High specificity strategies			
MEDLINE	**n = 753**	**n = 48,275**	**n varies by row**
cochrane database of systematic reviews.jn. OR search.tw. OR meta analysis.pt. OR MEDLINE.tw. OR systematic review.tw.	90.2% (88.1 to 92.3)	98.4% (98.3 to 98.5)	46.5% (43.9 to 49.0)
EMBASE	**n = 220**	**n = 27,549**	**n varies by row**
meta analysis.sh.	50.5% (43.9 to 57.1)	98.7% (98.6 to 98.9)	23.9% (20.0 to 27.8)
meta analysis.tw. OR systematic review.tw. OR MEDLINE.tw.	75.0% (69.3 to 80.7)	98.5% (98.4 to 98.7)	29.2% (25.4 to 32.9)
Strategies minimizing difference between sensitivity and specificity			
MEDLINE	**n = 753**	**n = 48,275**	**n varies by row**
meta analysis.mp,pt. or review.pt or search:.tw.	98.0% (97.0 to 99.0)	90.8% (90.5 to 91.1)	14.2% (13.3 to 15.2)
EMBASE	**n = 220**	**n = 27,549**	**n varies by row**
meta analysis:.mp. OR search:.tw. OR review.pt.	92.3% (88.7 to 95.8)	87.7% (87.3 to 88.1)	5.6% (4.9 to 6.4)

* Search strategies are presented in Ovid syntax.: = truncation; tw = text-word; mp = multiple posting; pt = publication type; di = diagnosis subheading; xs = exploded subheading; exp = exploded subject heading; jn = journal; sh = subject heading.

type, ''randomized controlled trial,'' which EMBASE did not support.

Strategies for detecting systematic reviews in MEDLINE and EMBASE (Table 2)

Strategies in both MEDLINE and EMBASE used text-words and index terms. The high-sensitivity strategy in MEDLINE was more sensitive than the comparable EMBASE strategy but had lower specificity. Both strategies included the publication type, ''review,'' but the MEDLINE strategy included an additional publication type, ''meta analysis,'' which was not supported in EMBASE. The EMBASE strategy used the subject heading, ''methodology,'' which was not supported in MEDLINE. In both databases, the textword, ''search:.,'' was a top-performing term.

The most specific strategies in MEDLINE and EMBASE were similarly specific, but the MEDLINE strategy had better sensitivity. The MEDLINE and EMBASE strategies used similar text-words (''MEDLINE.tw.'' and ''systematic review.tw''). In MEDLINE, the high-specificity strategy used the publication type, ''meta analysis,'' and the journal name, ''Cochrane Database of Systematic Reviews,'' both of which were uniquely supported in MEDLINE. This latter term retrieves Cochrane reviews, all of which would meet the criteria for a sound review. EMBASE did not index this publication. In EMBASE, the single term, ''meta analysis.sh.,'' also yielded high specificity.

The top-performing strategy for minimizing the difference between sensitivity and specificity in MEDLINE outperformed the comparable EMBASE strategy. The strategies were similar in the use of the terms, ''search:.tw.'' and ''review.pt.,'' but MEDLINE used the additional publication type, ''meta analysis.''

DISCUSSION

Top-performing filters in MEDLINE and EMBASE were not equivalent in the search terms used, although some overlap existed. MEDLINE search strategies generally outperformed EMBASE strategies, but, in both databases, strategies achieved high sensitivities and specificities, whereas precision peaked at about 50%. Precision is inevitably low in large multipurpose databases [28].

EMBASE incorporated fewer publication types than MEDLINE, and, in the strategies examined, the best MEDLINE strategies contained several publication types that were not supported in EMBASE. Table 3 displays the performance of these publication types, plus ''review.pt'' (supported in both databases), and compares them with the similar term searched as a subject heading or text-word in MEDLINE and EMBASE. All MEDLINE publication types attained specificities greater than 90% and reasonably high sensitivities (>77%), except the term, ''meta analysis.pt'' (possibly because the definition used for ''reviews'' encompassed reviews broader than only meta-analyses). EMBASE subject headings generally yielded better sensitivities than the similar text-words. Text-words had overall lower sensitivity but slightly higher specificity than index terms, a finding that is consistent with previous research [29].

As shown in Table 3, the higher sensitivities achieved by searching with publication types alone over text-words suggest an enhanced quality of indexing for publication types. This gives insight to the strategies in Tables 1 and 2, where use of publication types in MEDLINE yielded generally higher sensitivities. It follows that EMBASE strategies might be en-

Table 3
Comparison of publication type (pt), subject heading (sh), and text-word (tw) search strategies for detecting sound treatment or systematic review articles in MEDLINE and EMBASE in the year 2000

Ovid search strategy*	Sensitivity (95% CI)	Specificity (CI)	Precision (CI)
Strategies for retrieving sound treatment articles			
MEDLINE	**n = 930**	**n = 27,467**	**n varies by row**
clinical trial.pt.	94.7% (93.3 to 96.2)	94.4% (94.1 to 94.7)	35.6% (33.7 to 37.5)
clinical trials.sh.	0%	98.9% (98.8 to 99.0)	0%
clinical trial:.tw.	10.7% (8.7 to 12.6)	98.3% (98.2 to 98.5)	17.1% (14.0 to 20.1)
EMBASE	**n = 1,256**	**n = 26,513**	**n varies by row**
clinical trial.sh.	87.3% (85.5 to 89.2)	88.8% (88.5 to 89.2)	27.0% (25.7 to 28.4)
clinical trial:.tw.	10.7% (9.0 to 12.4)	98.2% (98.0 to 98.4)	21.9% (18.6 to 25.2)
MEDLINE	**n = 930**	**n = 27,467**	**n varies by row**
randomized controlled trial.pt.	92.8% (91.1 to 94.5)	97.6% (97.4 to 97.7)	55.5% (52.8 to 57.8)
randomized controlled trials.sh.	1.0% (0.3 to 1.6)	98.1% (97.9 to 98.2)	1.6% (0.6 to 2.7)
randomized controlled trial:.tw.	9.9% (8.0 to 11.8)	99.4% (99.3 to 99.4)	33.2% (27.8 to 38.7)
EMBASE	**n = 1,256**	**n = 26,513**	**n varies by row**
randomized controlled trial.sh.	75.7% (73.4 to 78.1)	96.6% (96.4 to 96.8)	51.3% (49.1 to 53.6)
randomized controlled trial:.tw.	9.5% (7.9 to 11.1)	99.4% (99.3 to 99.5)	41.9% (36.2 to 47.6)
Strategies for retrieving sound systematic reviews			
MEDLINE	**n = 439**	**n = 28,958**	**n varies by row**
meta analysis.pt.	19.1% (15.5 to 22.8)	99.7% (99.6 to 99.8)	48.8% (41.4 to 56.3)
meta analysis.sh.	3.0% (1.4 to 4.6)	99.8% (99.7 to 99.9)	19.1% (9.8 to 28.5)
meta-analysis.tw.	25.5% (21.4 to 29.6)	99.8% (99.7 to 99.9)	62.6% (55.5 to 70.0)
EMBASE	**n = 220**	**n = 27,549**	**n varies by row**
meta analysis.sh.	50.5% (43.9 to 57.1)	98.7% (98.6 to 98.9)	23.9% (20.0 to 27.8)
meta-analysis.tw.	38.6% (32.2 to 45.1)	99.5% (99.4 to 99.6)	40.3% (33.7 to 46.9)
MEDLINE	**n = 439**	**n = 28,958**	**n varies by row**
review.pt.	77.5% (73.5 to 81.4)	92.0% (91.7 to 92.3)	12.8% (11.5 to 14.0)
systematic review:.tw.	22.1% (18.2 to 25.9)	99.8% (99.7 to 99.9)	66.4% (58.8 to 74.1)
EMBASE	**n = 220**	**n = 27,549**	**n varies by row**
review.pt.	36.4% (30.0 to 42.7)	90.1% (89.7 to 90.4)	2.8% (2.2 to 3.5)
review.sh.	36.8% (30.4 to 43.2)	90.0% (89.6 to 90.4)	2.9% (2.2 to??)
systematic review:.tw.	35.6% (29.1 to 41.8)	99.7% (99.6 to 99.8)	45.6% (38.2 to 53.1)

* Search strategies are presented in Ovid syntax.: = truncation; tw = word or phrase appears in title or abstract.

hanced by expanding the available range of relevant publication types.

In the absence of a greater range of publication types in EMBASE, comprehensive searches should use subject headings with a methodologic focus over similar text-words to potentially improve sensitivity while maintaining a smaller difference between sensitivity and specificity. Text-word searching, however, remains valuable because text-words are versatile, do not rely on consistent indexing, and can be used to detect citation of ''in process'' articles that have not yet been assigned indexing terms. Comparing the use of text-words in the two databases is difficult because of differences in the spelling of key words, such as ''randomized'' in the United States and ''randomised'' in most European countries, or the different use of various methodologic concepts. An example of different use of methodologic concepts can be made with the term, ''overview.'' In the United States, an ''overview'' is considered to be a narrative review (a review that does not meet the methodologic criteria used in this study), whereas in the United Kingdom, an ''overview'' is considered to be a comprehensive systematic review (a review that would meet the methodologic criteria used in this study). Text-word searching requires the use of exact spelling of text-words in articles. Authors who use commonly understood text-words in titles and abstracts can facilitate a successful search.

Further work is necessary to determine the degree of overlap of citations retrieved using MEDLINE and EMBASE strategies. Better search strategies can probably be developed, but they would likely be more complex than those reported here, and improvements in sensitivity will be offset by decreases in specificity, or vice versa.

CONCLUSION

Optimal filters in MEDLINE and EMBASE for detecting treatment and review articles attained high performance using different search terms. Extra publication types in MEDLINE appeared to increase search sensitivity, and MEDLINE filters generally performed a little better than EMBASE filters. Considering the unique content coverage and search terms available in MEDLINE and EMBASE, information professionals would be best served by searching the database that is most relevant to their setting or searching both databases to improve a comprehensive search.

AUTHOR CONTRIBUTIONS

Haynes and Wilczynski prepared grant submissions in relation to this project, supplied intellectual content to the collection and analysis of data, and were involved in data analysis and staff supervision. Wilczynski and Wong participated in the data collection. All authors drafted, commented on, and approved the final manuscript.

ACKNOWLEDGMENTS

The funding organization (National Library of Medicine, USA.) had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review, and approval of the manuscript. The Hedges Team includes Angela Eady, Brian Haynes, Susan Marks, Ann McKibbon, Doug Morgan, Cindy Walker-Dilks, Stephen Walter, Stephen Werre, Nancy Wilczynski, and Sharon Wong, all in the Health Information Research Unit, Department of Clinical Epidemiology and Biostatistics at McMaster University, Hamilton, Ontario, Canada.

REFERENCES

1. Westbrook JI, Gosling AS, Coiera E. Do clinicians use online evidence to support patient care? a study of 55,000 clinicians. J Am Med Inform Assoc 2004 Mar–Apr;11:113–20. Epub 2003 Dec 07.
2. McDonald S, Taylor L, Adams C. Searching the right database. a comparison of four databases for psychiatry journals. Health Libr Rev 1999 Sep;16(3):151–6.
3. Royle P, Bain L, Waugh N. Systematic reviews of epidemiology in diabetes: finding the evidence. BMC Med Res Methodol 2005 Jan 8;5(1):2.
4. Jadad AR, McQuay HJ. A high-yield strategy to identify randomized controlled trials for systematic reviews. Online J Curr Clin Trials 1993 Feb 27 ◊ c no. 33.
5. Marson AG, Chadwick DW. How easy are randomized controlled trials in epilepsy to find on Medline? the sensitivity and precision of two Medline searches. Epilepsia 1996 Apr;37(4):377–80.
6. Adams CE, Power A, Frederick K, LeFebvre C. An investigation of the adequacy of MEDLINE searches for randomized controlled trials (RCTs) of the effects of mental health care. Psychol Med 1994 Aug;24(3):741–8.
7. Dumbrigue HB, Esquivel JF, Jones JS. Assessment of MEDLINE search strategies for randomized controlled trials in prosthodontics. J Prosthodont 2000 Mar;9(1):8–13.
8. Nwosu CR, Khan KS, Chien PF. A two-term MEDLINE search strategy for identifying randomized trials in obstetrics and gynecology. Obstet Gynecol 1998 Apr;91(4):618–22.
9. Robinson KA, Dickersin K. Development of a highly sensitive search strategy for the retrieval of reports of controlled trials using PubMed. Int J Epidemiol 2002 Feb;31(1): 150–3.
10. Wilczynski NL, Walker CJ, McKibbon KA, Haynes RB. Assessment of methodologic search filters in MEDLINE. Proc Annu Symp Comput Appl Med Care 1993:601–5.
11. Haynes RB, Wilczynski N, McKibbon KA, Walker CJ, Sinclair JC. Developing optimal search strategies for detecting clinically sound studies in MEDLINE. J Am Med Inform Assoc 1994 Nov–Dec;1(6):447–58.
12. Wilczynski NL, Haynes RB, for the Hedges Team. Developing optimal search strategies for detecting clinically sound causation studies in MEDLINE. AMIA Annu Symp Proc 2003:719–23.
13. Wong SSL, Wilczynski NL, Haynes RB, Ramkissoonsingh R, for the Hedges Team. Developing optimal search strategies for detecting sound clinical prediction studies in MEDLINE. AMIA Annu Symp Proc 2003:728–32.
14. Haynes RB, Wilczynski NL, for the Hedges Team. Optimal search strategies for retrieving scientifically strong studies of diagnosis from MEDLINE. BMJ 2004 May 1; 328(7447):1040. Epub 2004 Apr 08.
15. Wilczynski NL, Haynes RB, for the Hedges Team. Developing optimal search strategies for detecting clinically sound prognostic studies in MEDLINE: an analytic survey. BMC Med 2004 Jun 9;2(1):23.
16. Wong SS, Wilczynski NL, Haynes RB. Developing optimal search strategies for detecting clinically relevant qualitative studies in MEDLINE. Medinfo 2004; 2004:311–6.
17. Montori VM, Wilczynski NL, Morgan D, Haynes RB, for the Hedges Team. Optimal search strategies for retrieving systematic reviews from MEDLINE: analytical survey. BMJ 2005 Jan 8;330(7482):68–73.
18. Haynes RB, McKibbon KA, Wilczynski NL, Walter SD, Werre SR. Optimal search strategies for retrieving scientifically strong studies of treatment from Medline: analytical survey. BMJ 2005 May 21;330(7501):1179. Epub 2005 May 13.
19. Holland JL, Wilczynski NL, Haynes RB, Hedges Team. Optimal search strategies for identifying sound clinical prediction guides in EMBASE. BMC Med Inform Decis Mak 2005 Apr 29;5(1):11.
20. Wilczynski NL, Haynes RB. Optimal search strategies for detecting clinically sound prognostic studies in EMBASE: an analytic survey. J Am Med Inform Assoc 2005 Jul–Aug; 12(4):481–5.
21. Wilczynski NL, Haynes RB, Hedges Team. EMBASE search strategies for identifying methodologically sound diagnostic studies for use by clinicians and researchers. BMC Med 2005 Mar 29;3(1):7.
22. Haynes RB, Kastner M, Wilczynski NL, Hedges Team. Developing optimal search strategies for detecting clinically sound and relevant causation studies in EMBASE. BMC Med Inform Decis Mak 2005 Mar 22;5(1):8.
23. Health Information Research Unit, McMaster University.Full title of journals indexed in MEDLINE. [Web document]. [cited 9 Jun 2006]. <http://hiru.mcmaster.ca/hedges/Medline%20journals%20read.pdf>.
24. Health Information Research Unit, McMaster University.List of EMBASE journals. [Web document]. [cite 9 Jun 2006]. <http://hiru.mcmaster.ca/hedges/List%20of%20EMBASE%20Journals.pdf>.
25. Wilczynski NL, McKibbon KA, Haynes RB. Enhancing retrieval of best evidence for health care from bibliographic databases: calibration of the hand search of the literature. Medinfo 2001; 10(pt. 1):390–3.
26. Wong SSL, Wilczynski NL, Haynes RB, for the Hedges Team. Developing optimal search strategies for detecting clinically sound treatment studies in EMBASE. J Med Libr Assoc:[accepted for publication].
27. Wilczynski NL, Haynes RB, for the Hedges Team. EMBASE search strategies achieved high sensitivity and specificity for retrieving methodologically sound systematic reviews. J Clin Epidemiol:[accepted for publication].
28. Bachmann LM, Estermann P, Kronenberg C, ter Riet G. Identifying diagnostic accuracy studies in EMBASE. J Med Libr Assoc 2003 Jul;91(3):341–6.
29. Lowe HJ, Barnett GO. Understanding and using the Medical Subject Headings (MeSH) vocabulary to perform literature searches. JAMA 1994 Apr 13;271(14):1103–8.

Received September 2005; accepted June 2006